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Digital Literacy Competence: Learning Environment and Parental Support for Vocational High School Students' Learning Motivation

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ABSTRACT

In the era of digital transformation, vocational high school students must possess strong learning motivation to master essential technical competencies. However, fluctuations in motivation are often driven by how effectively students manage digital literacy, utilize their learning environment, and receive moral support from their families. This study aims to analyze the levels of digital literacy competence, learning environment utilization, parental support, and learning motivation among vocational high school students, while examining the partial and simultaneous influences of these factors on motivation. Employing a quantitative approach with an ex post facto design, the research sampled 150 11th-grade Computer and Network Engineering students from three public vocational schools in Makassar City, selected via proportional random sampling. Data were collected using validated Likert-scale questionnaires and analyzed through descriptive and associative regression techniques. Findings indicate that all variables—digital literacy, learning environment, parental support, and learning motivation—fall within the high to very high categories (65%–80%). Partially, digital literacy (R^2=0.585), learning environment (R^2=0.262), and parental support (R^2=0.575) significantly affect motivation. Simultaneously, these variables contribute 71.7% to learning motivation (F_count=123.423 > F_table=2.67), with parental support emerging as the most dominant factor (β=0.781). This study underscores that enhancing vocational motivation requires a synergy between digital proficiency and active parental involvement. Consequently, schools should develop integrated digital literacy programs that foster stronger parental participation to optimize student engagement.

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1. INTRODUCTION

The rapid development of information technology requires the education sector to improve the quality of learning to align with industry needs (Lamada & Dewi, 2024; Mardis et al., 2018). Vocational education, particularly vocational high schools, plays a strategic role in producing a competitive workforce in the digital revolution (Guo & Liu, 2025; Wismansyah et al., 2024). Although designed to equip students with practical

skills relevant to the job market, a major challenge arises from low motivation to learn. According to data from the Ministry of Education and Culture for the 2024/2025 academic year, the highest dropout rate is at the vocational high school level (0.19%), driven by a lack of motivation. Yet, learning motivation and self-efficacy are crucial factors that significantly influence the development of employability skills and student academic achievement (Areisy & Sudira, 2022; Li & Phakdeephirot, 2022; Mack & Honig, 2024).

Empirical conditions in the field indicate that vocational high school students' learning motivation is often dominated by extrinsic motivation, resulting in a lack of intrinsic motivation that results in low student engagement (Pat-El et al., 2024; Poupard et al., 2025). Research on vocational high school students demonstrates the significant influence of motivation on student engagement (Niittylahti et al., 2023), while a study at Vocational High School confirmed that strong intrinsic motivation is directly proportional to positive learning behavior (Misbah et al., 2015; Raihan et al., 2024). Without strong internal motivation, students tend to struggle to master the required technical competencies even though adequate learning facilities and infrastructure are available at school (Arfani et al., 2024).

This phenomenon of low motivation is also evident in Makassar City, particularly in the Computer and Network Engineering (TKJ) department. Observations indicate a tendency for students to use digital devices more for entertainment than for academic purposes, a finding reinforced by findings at State Vocational High School 10 Makassar regarding the negative correlation between uncontrolled device use and academic achievement. In addition, environmental factors such as school well-being and learning readiness have been shown to be important determinants in influencing student motivation and learning outcomes in various vocational schools in Makassar, including a correlation between low motivation and increased learning difficulties.

The low learning motivation of vocational high school students in Makassar is partly due to their suboptimal digital literacy skills. Despite being considered a digital native generation, many students are unable to use technology critically and responsibly to support the learning process. Digital literacy encompasses the ability to access, evaluate, and produce information (Akib et al., 2022; Khairunnisa et al., 2025), yet Indonesia's national index remains in the moderate category (Jaya et al., 2024; Sonni et al., 2025; Wismansyah et al., 2024). This situation has resulted in technology utilization in education not reaching its full potential, resulting in technology being used more for entertainment than as a means of developing technical competencies.

In addition to internal factors, optimizing the learning environment plays a crucial role in shaping student motivation (Ahmad, 2021; Cayubit, 2022). A conducive learning environment is not limited to the availability of physical facilities but also to how these facilities facilitate collaborative interaction and access to digital learning resources (Keser Aschenberger et al., 2023; Ng, 2021). This aligns with the findings of Lamada and Dewi (2024) that external factors such as educators and the social environment have a strong influence of 67.4% on learning interest. However, the reality is that many students are still not accustomed to using laboratories independently or actively

participating in collaborative projects (Bower et al., 2017; Mebert et al., 2020), indicating that the main challenge lies in effectively utilizing available facilities.

Parental support, both financial and moral, is a significant determinant of student motivation, whether they are inclined to work immediately or continue their studies (Islam & Chakrabarty, 2020; Mitchall & Jaeger, 2018). Research at vocational high schools revealed that parental attention influences learning motivation (Hafid, 2025), while parental motivation also impacts students' interest in continuing their higher education (Fitriani, 2025; Wulansari et al., 2023). If the synergy between digital literacy, the learning environment, and family support is not immediately strengthened, it is feared that vocational high school graduates will not master their skills optimally (Statti & Torres, 2020). Therefore, this study aims to analyze the level of digital literacy competency, use of the learning environment, parental support, and their partial and simultaneous influence on the learning motivation of vocational high school students in Makassar City.

2. METHOD

This study used a quantitative approach with an ex post facto design to analyze the relationships between variables without providing special treatment to the research subjects. The research location focused on three vocational high schools in Makassar City, South Sulawesi Province: Vocational High Schools 2 Makassar, Vocational High Schools 3 Makassar, and Vocational High Schools 10 Makassar. The study population included 240 students majoring in Computer and Network Engineering (TKJ), with a sample of 150 respondents determined using a proportional random sampling technique to ensure accurate data representation from each school.

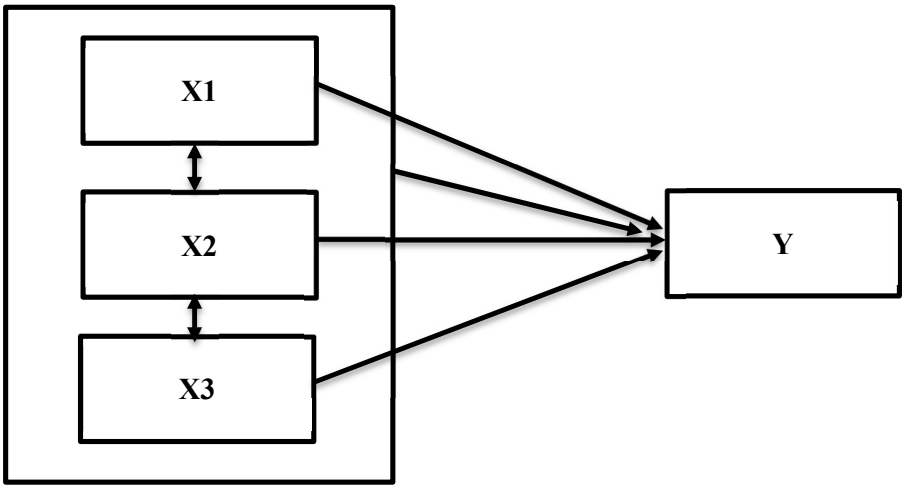

Figure 1. Ex Post Facto Design

This research design involved three independent variables: digital literacy competency (X_1), use of the learning environment (X_2), and parental support (X_3), as well as one dependent variable, student learning motivation (Y). Data were collected efficiently through a digital questionnaire based on Google Forms using a five-level

Likert scale. This instrument is designed with measurable score weights, ranging from Strongly Agree (score 5), Agree (score 4), Undecided (score 3), Disagree (score 2), to Strongly Disagree (score 1), to facilitate in-depth statistical analysis of each variable studied.

The data collection process in this study was conducted systematically by distributing a digital questionnaire to predetermined respondents. Before further analysis, the instrument was tested to ensure its quality. The validity test results showed that all statement items had a Corrected Item-Total Correlation (r_hitung) value greater than the r_tabulated value, thus declaring the instrument valid and capable of accurately measuring the research variables. Furthermore, a reliability test was also conducted to ensure the consistency of respondents' responses over a specific period.

The data analysis techniques employed consisted of descriptive statistical analysis and inferential statistical analysis. Descriptive analysis was used to provide an overview of the frequency distribution, average (mean) values, and achievement categorization of each variable, both independent and dependent. This step is crucial for comprehensively mapping the digital literacy profile, learning environment utilization, parental support, and student learning motivation at the research site.

To test the research hypotheses, a linear regression analysis was conducted, preceded by classical assumption tests to ensure the research model met econometric criteria. The classical assumption tests applied included normality, linearity, and multicollinearity tests. Furthermore, hypothesis testing was carried out through simple and multiple linear regression analysis, which included the T-test to see the partial effect, the F-test to see the simultaneous effect, and analysis of the coefficient of determination (R^2) to determine the extent of the contribution of independent variables to student learning motivation.

3. RESULTS AND DISCUSSION

Results

Descriptive statistics were used to present an initial description of the research data before further testing with SPSS. This analysis helps demonstrate the distribution patterns of responses demonstrated by respondents on the variables of Digital Literacy Competence, Use of Learning Environments, Parental Support, and Learning Motivation. The values presented include minimum, maximum, average (mean), and standard deviation scores, which overall reflect the distribution and trends of respondents' perceptions.

Descriptive Analysis

Table 1. Descriptive Analysis

Variable	N	Min	Max	Mean	Median	Std. Deviation
Digital Literacy Competence	150	69.00	100.00	87.5400	89.0000	7.64799

Variable	N	Min	Max	Mean	Median	Std. Deviation
Use of Learning Environments	150	90.00	120.00	107.6600	108.0000	7.23046
Parental Support	150	53.00	80.00	71.9267	73.0000	6.53858
Learning Motivation	150	99.00	140.00	124.4667	127.0000	10.80248

The descriptive analysis results in Table 1 show that the Digital Literacy Competence variable, with 150 respondents (N), showed a score range of 69.00 to 100.00. The mean score was 87.54, with a median of 89.00 and a standard deviation of 7.65. Meanwhile, the Use of Learning Environment variable recorded a minimum score of 90.00 and a maximum score of 120.00. The average score for this variable was 107.66, with a median of 108.00, and a standard deviation of 7.23 indicating data variability.

Conversely, the Parental Support variable had a score range of 53.00 to 80.00, with a mean score of 71.93 and a median of 73.00. The standard deviation for this variable was 6.54, indicating a relatively stable distribution of data. Finally, the Learning Motivation variable showed a wider range of values, ranging from 99.00 to 140.00. This variable produced the highest average of 124.47 with a median of 127.00 and a standard deviation of 10.80, reflecting significant diversity in motivation levels among respondents.

Classical Assumption Test

Table 2. Normality Test Results

N		150
Normal Parameters[a,b]	Mean	0,0000000
	Std. Deviation	5,74462068
Most Extreme Differences	Absolute	0,066
	Positive	0,066
	Negative	-0,065
Test Statistic		0,.066
Asymp. Sig. (2-tailed)		0,200[c,d]

The results of the normality test on 150 datasets yielded an Asymp. Sig. (2-tailed) value of 0.200. Given that this significance value is significantly greater than the established threshold of 0.05, the research data can be concluded to be normally distributed. This finding confirms that the data distribution in the study follows a consistent theoretical distribution pattern, thus meeting the requirements for objectivity in statistical data processing.

Meeting this normality assumption has important implications for subsequent analysis stages, where the data are considered representative and fall within a reasonable distribution range. Thus, the use of parametric statistical analysis methods is

methodologically sound. This allows researchers to conduct hypothesis testing with a higher degree of accuracy and draw valid conclusions from the studied population.

Table 3. Linearity Test Results

Model		Sig.
Learning Motivation [Y] Digital Literacy Competence [X1]	Deviation from Linearity	0,598
Learning Motivation [Y] Use of the Learning Environment [X2]	Deviation from Linearity	0,476
Learning Motivation [Y] Parental Support [X3]	Deviation from Linearity	0,136

The results of the linearity test showed that all independent variables, including Digital Literacy Competence (X_1), Use of the Learning Environment (X_2), and Parental Support (X_3), had a linear relationship with Learning Motivation (Y). This was confirmed by the significance values in the Deviation from Linearity test for each variable, which were 0.598, 0.476, and 0.136, respectively. Since all values were above the 0.05 threshold, it can be concluded that there were no significant deviations from the linear relationship pattern between the independent and dependent variables.

These results indicate that the research data met the linearity assumption required in regression analysis. Fulfillment of this assumption indicates that the linear model used can accurately represent the relationship between variables, allowing the estimated effect of variable X on Y to be further analyzed with a high level of validity. Therefore, the correlation between digital literacy, the learning environment, and parental support on learning motivation can be processed using parametric statistical procedures.

Table 4. Multicollinearity Test Results

Model		Collinearity Statistic	
		Tollerance	VIF
1	Digital Literacy Competence [X1]	0,491	2,038
	Use of Learning Environment [X2]	0,784	1,276
	Parental Support [X3]	0,543	1,843

The results of the multicollinearity test in the Table 4 above, obtained the Tolerance and VIF values of each independent variable. The tolerance value of the Digital Literacy Competence variable (X1) is 0.491 with a VIF value of 2.038, the Use of Learning Environment variable (X2) has a tolerance value of 0.784 with a VIF value of 1.276, while the Parental Support variable (X3) has a tolerance value of 0.543 with a VIF value of 1.843. All independent variables have a tolerance value greater than 0.10 and a VIF value less than 10. This indicates that there are no symptoms of multicollinearity between the independent variables in the regression model.

Hypothesis Testing

The Influence of Digital Literacy Competence on Student Learning Motivation

Table 5. Results of the Summary Model Test of the Effect of Digital Literacy Competence on Student Learning Motivation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,765[a]	0,585	0,582	6,98573

The data analysis results in Table 5 yield a correlation coefficient (R) of 0.765, indicating a strong relationship between Digital Literacy Competence and Student Learning Motivation. The coefficient of determination (R Square) of 0.585 indicates that 58.5% of the variation in Student Learning Motivation can be significantly explained by Digital Literacy Competence. Meanwhile, the remaining 41.5% is influenced by factors outside the regression model examined in this study.

Furthermore, the Adjusted R Square value of 0.582, which is close to the R Square value, indicates that the regression model used has a very good level of consistency. The accuracy of this model is also supported by the Std. Error of the Estimate value of 6.98573, which reflects a relatively small deviation between the predicted and actual values. Thus, this model is considered representative and has adequate reliability in predicting students' learning motivation levels based on their digital literacy competencies.

Table 6. Results of Coefficients of the Influence of Digital Literacy Competence on Student Learning Motivation

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	29,926	6,575		4,551	0,000
	Digital Literacy Competence	1,080	0,075	0,765	14,432	0,000

Building upon the Table 6, mathematically, the regression equation Y = 29.926 + 1.080X indicates that every one-unit increase in digital literacy competency will increase students' learning motivation scores by 1.080 units, assuming other variables are constant. The constant value of 29.926 represents students' learning motivation scores when digital literacy competency is at zero. The positive regression coefficient confirms the unidirectional relationship between the two variables.

The Influence of Using Learning Environments on Student Learning Motivation

Table 7. Summary Model Results of the Effect of Using Learning Environments on Student Learning Motivation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,511[a]	0,262	0,257	9,31425

The Table 7 shows an R value of 0.511, indicating a moderate relationship between the variable Use of Learning Environment and Student Learning Motivation. The R Square value of 0.262 indicates that 26.2% of the variation in Student Learning Motivation can be explained by the variable Use of Learning Environment, while the remaining 73.8% is influenced by other factors outside this regression model. The Adjusted R Square value of 0.257, which is relatively close to the R Square value, indicates that the regression model used has a good level of consistency. Meanwhile, the Std. Error of the Estimate value of 9.31425 indicates a relatively small level of deviation between the predicted and actual values, so this model can be said to be quite good in predicting student learning motivation.

Table 8. Results of Coefficients of the Influence of the Use of Learning Environment on Student Learning Motivation

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	42,208	11,387		3,707	0,000
	Use of Learning Environment	0,764	0,106	0,511	7,240	0,000

Table 8 above, mathematically, the regression equation Y = 42.208 + 0.764X indicates that every one-unit increase in learning environment use will increase students' learning motivation scores by 0.764 units, assuming other variables are constant. The constant value of 42.208 represents students' learning motivation scores when learning environment use is at zero. The positive regression coefficient confirms the existence of a unidirectional relationship between the two variables.

The Influence of Parental Support on Student Learning Motivation

Table 9. Summary Model Results of the Influence of Parental Support on Student Learning Motivation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,759[a]	0,575	0,573	7,06287

Based on the Table 9, the R value is 0.759, indicating a strong relationship between the Parental Support variable and Student Learning Motivation. The R Square value of 0.575 indicates that 57.5% of the variation in Learning Motivation can be explained by the Parental Support variable, while the remaining 42.5% is influenced by other factors outside this regression model. The Adjusted R Square value of 0.573 is relatively close to the R Square value, indicating that the regression model used has a good level of consistency. Meanwhile, the Std. Error of the Estimate value of 7.06287 indicates a relatively small level of deviation between the predicted and actual values, so this model can be said to be quite good in predicting student learning motivation.

Table 10. Coefficients of the Influence of Parental Support on Student Learning Motivation

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	34,328	6,391		5,371	0,000
	Parental Support	1,253	0,088	0,759	14,162	0,000

The analysis results in the table above yield a regression equation of Y = 34.328 + 1.253X, which illustrates the influence of parental support on student learning motivation. The constant value of 34.328 represents the estimated level of student learning motivation when the parental support variable is held at zero or constant. Mathematically, this indicates a persistent internal motivational foundation within the student before being influenced by external factors from the family environment.

The positive regression coefficient of 1.253 confirms a significant unidirectional relationship between the two variables. This means that every one-unit increase in parental support is predicted to increase the student's learning motivation score by 1.253 units, assuming the other variables in the model are held constant. This finding reinforces the position of parental support as a crucial stimulant that linearly contributes to optimizing student learning motivation.

The Influence of Digital Literacy Competence, Use of Learning Environments, and Parental Support on Students' Learning Motivation

Table 11. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,847[a]	0,717	0,711	5,80334

The results of the multiple linear regression analysis above, the correlation coefficient R value was obtained at 0.847. This value indicates that there is a very strong relationship between digital literacy competency, use of the learning environment, and parental support together on student learning motivation. The R Square value of 0.717 indicates that 71.7% of the variation in student learning motivation can be explained by the three independent variables, while the remaining 28.3% is influenced by other factors outside this research model. The Adjusted R Square value of 0.711 indicates that the regression model has a good ability to explain the relationship between variables after adjusting for the number of predictors used. Meanwhile, the Std. Error of the Estimate value of 5.80334 indicates that the level of prediction error of the regression model is relatively low.

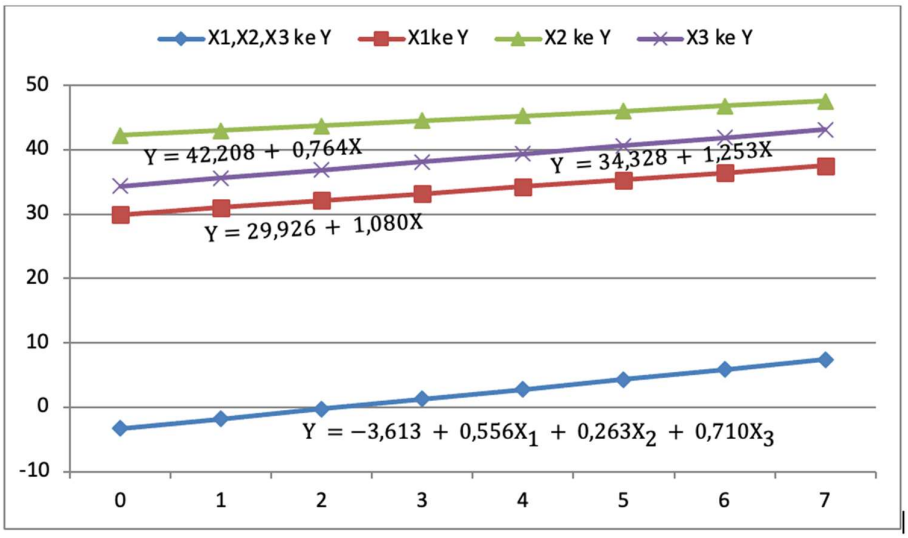

Figure 1. Simultaneous Regression Equation Diagram

Figure 1 above shows that all independent variables have a positive relationship with the dependent variable, namely student learning motivation. This is indicated by the slope of the regression line which tends to increase for each variable, both partially and simultaneously. The partial regression equation shows that variable X_1 against Y has the equation Y = 29.926 + 1.080X, which indicates that every one-unit increase in variable X_1 is followed by an increase in student learning motivation of 1.080 units. Variable X_2 against Y shows the equation Y = 42.208 + 0.764X, which indicates a positive influence with an increase in learning motivation of 0.764 units for every one-unit increase in X_2.

Meanwhile, variable X_3 against Y has a regression equation Y = 34.328 + 1.253X, which indicates that this variable has the strongest partial influence on student learning motivation compared to other variables. In the combined regression graph, the simultaneous regression equation is shown by Y = -3.613 + 0.556X1 + 0.263X2 + 0.710X3, which shows that the three independent variables together provide a positive contribution to student learning motivation. The combined regression line shows a consistent increasing trend, reflecting the accumulated influence of variables X_1, X_2, and X_3 on variable Y. Overall, the pattern of the graph and the regression equation confirm that the higher the value of each independent variable, the higher the student learning motivation, both viewed partially and simultaneously.

Discussion

Digital Literacy Competency Level, Learning Environment, Parental Support, and Learning Motivation

Descriptive analysis results show that students' digital literacy competencies are in the very high (66.7%) and high (33.3%) categories. These findings indicate that students can access, evaluate, and utilize digital information effectively, in line with the DigComp 2.2 framework, which covers aspects of information management, digital communication, content creation, security, and technology-based problem solving (Vuorikari et al., 2022). Furthermore, utilization of the learning environment is also in

the very high (80%) and high (20%) categories, reflecting that students have maximized the available learning resources and facilities.

This is further supported by parental support, which is in the very high (70.7%) and high (28.7%) categories, and student learning motivation, which is generally dominated by the high (69.3%) and very high (30.7%) categories. Overall, these data illustrate the creation of a comprehensive and supportive learning ecosystem in vocational high schools in Makassar City. The integration of technological skills, adequate facilities, and psychosocial support from the family environment has been proven to be able to build a solid foundation for creating optimal student academic motivation.

The Influence of Digital Literacy Competence on Learning Motivation

The results of a simple linear regression test indicate that digital literacy competency has a positive and significant influence on student learning motivation, thus the first hypothesis (H_1) is accepted. Students' ability to effectively manage digital learning resources has been shown to encourage active engagement and increase their confidence in facing various academic tasks. This finding confirms that mastery of digital literacy is not merely a technical skill, but rather a crucial catalyst that strengthens students' internal drive to excel in an increasingly digitalized learning environment.

This research finding aligns with a study by Song et al. (2025), which confirmed that students with high digital literacy have better abilities in managing online learning resources and demonstrate stronger motivation. Furthermore, this finding is supported by a study by Zakir et al. (2025), which found that digital literacy can increase motivation through the mediation of self-efficacy. Overall, the integration of information navigation skills and digital content management is a key foundation for creating a productive and motivating learning ecosystem for students.

The Influence of Using Learning Environment on Learning Motivation

The results of a simple linear regression test indicate that the use of a learning environment has a positive and significant effect on student learning motivation (H1 is accepted). A conducive environment, both in terms of spatial arrangement, facility availability, and learning atmosphere, provides a more meaningful learning experience. This finding is in line with Firman and Sandiarsa (2024) who proved that a conducive learning environment has a positive effect on motivation through teacher support and classroom comfort, and Khany and Barzan (2025) who found that flexible classroom design increases students' cognitive and emotional engagement.

The Influence of Parental Support on Learning Motivation

The results of a simple linear regression test indicate that parental support has a positive and significant effect on student learning motivation (H1 is accepted). Parental attention, emotional encouragement, and active involvement can foster students' self-confidence and learning discipline. These results are supported by Özyıldırım (2024), who found a significant effect of parental support on academic habits and motivation, and Makkar (2025), who confirmed that parental involvement in the informational,

emotional, and instrumental dimensions is positively correlated with student learning motivation and achievement.

Simultaneous Influence on Learning Motivation

The results of the multiple regression analysis indicate that digital literacy competency, use of the learning environment, and parental support simultaneously have a positive and significant effect on student learning motivation (H1 is accepted). The three variables complement each other: digital literacy facilitates access to modern learning resources, a conducive learning environment increases comfort and focus, and parental support fosters sustained psychological motivation. Parental support is the variable with the most dominant influence, followed by digital literacy competency and use of the learning environment. These findings reinforce the arguments of Gusmawan and Hariyadi (2022) that parental support is the most powerful external factor in maintaining learning motivation, as well as Li and Xue (2023) who emphasized the direct influence of the quality of the learning environment on student engagement. Overall, these results emphasize the importance of synergy between schools and families in building an optimal learning ecosystem for vocational high school students in the digital era.

4. CONCLUSION

The results of the study indicate that the variables of digital literacy competency, utilization of the learning environment, parental support, and learning motivation of class XI Computer and Network Engineering students at State Vocational High Schools in Makassar City are in the high to very high category (65%–80%), where these three factors simultaneously contribute significantly to learning motivation by 71.7% ($F_{calculated}=123.423 > F_{table}=2.67$). Partially, digital literacy contributes an influence of 58.5% ($R^2=0.585$), the learning environment 26.2% ($R^2=0.262$), and parental support 57.5% ($R^2=0.575$) which also emerged as the most dominant factor ($\beta=0.781$). These findings confirm that strengthening academic motivation in the era of digital transformation does not only depend on individual technological skills but requires strong synergy through active involvement and moral support from the family environment.

As a suggestion, it is recommended for educational units to design a digital literacy strengthening program that integrates technical and managerial aspects of information, accompanied by increased communication synergy with parents to create a harmonious supporting ecosystem between school and home. Considering that parental support is the most dominant factor in triggering learning motivation, parents are expected to continue to increase their active involvement through continuous moral and motivational guidance, going beyond simply providing physical facilities. Finally, for future researchers, it is recommended to explore other variables amounting to 28.3% that have not been revealed in this model—such as self-efficacy, teacher leadership style, or peer influence—to provide a more comprehensive picture in optimizing learning motivation in vocational education environments.

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